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UNCLASSIFIED- SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

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I. GENERAL

Further Details on IGY Participation in Hungary

Solar observations are being conducted in Hungary at the Department of Solar Physics of the Academy observatory and at the Urania Observatory. At present, only sun spots and faculae are being observed. This is done by projecting the image of the sun through a telescope and fixing the position of the phenomena. This procedure establishes the location of the spots and faculae, and enables the observer to note changes in solar activity.

It would be important to observe solar eruptions, too. Such observations require the use of a spectrohelioscope. It is probable that spectrohelioscopic observation will soon begin in Hungary.

Most recently, the Gyorgy Marczel Observatory of Pestlorinc has been observing the field strength of "distant" senders in addition to measuring ion density and strata height in the ionosphere.

Satellite tracking in Hungary was organized by the academy observatory and the Astronautical Committee of the Society for the Propagation of Social and Natural Sciences, with the cooperation of the League of Freedom Fighters. The satellites are being tracked both optically and by radio. Endre Magyari, engineer, has constructed a special device for the latter purpose.

The supersensitive Geiger-Mueller "telescope" of the Central Physics Research Institute (Kozponti Fizikai Kutato Intezet) was recently completed. With the aid of this device, which consists of Geiger counters, changes in the intensity of cosmic radiation are being studied.

The Kekesteto station of the Meteorological Institute is measuring ultraviolet radiation.

The Lorand Eotvos Institute of Geophysics (Eotvos Lorand Geofizikai Intezet) is conducting theoretical research and making gravimetric measurements to determine more precisely the lunisolar effect caused by the attractive force of the Sun and Moon. -- Lajos Bartha, Jr; Peter Hedervari (Budapest, Muszaki Elet, No 6, 3 Apr 58, p 2)

II. METEOROLOGY

USSR to Build People's Observatories

In an effort to further astronomical knowledge among the masses, the USSR plans to build a number of people's observatories. This work has been assumed by the Cultural Administration of the Executive Committee of Moscow City Soviet of Workers Deputies.

The people's observatories will be one-and-a-half-story cylindrical brick buildings with rotating cupolas 5 meters in diameter. Astronomical platforms with various instruments for observing celestial bodies will be arranged around them. More than ten of these observatories will be constructed in Moscow and in Moskovskaya Oblast. Four of these, located in the parks of the city, are to be opened in July.

Telescopes will be mounted inside the observatories. These telescopes were recently obtained from the German Democratic Republic by the Moscow Planetarium. The telescopes are 2 1/2 meters long, with objectives 13 centimeters in diameter. With these, it will be possible to conduct observations of celestial bodies and to photograph their motion. (Moscow, Izvestiya, 18 May 58)

III. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Sputnik III Reportedly Launched With Single Rocket

"The third Soviet artificial Earth satellite was launched with a single-stage rocket and not a two-stage rocket," writes Soviet Academician Shternfeld in a book entitled Artifical Satellites. (Marseille, Le Marseilaise, 22 May 58, p 10)

[Note: Shternfel'd's book, Iskusstvenniye Sputniki (Artificial Satellites), which is the revised and enlarged second edition of Iskusstvennyye Sputniki Zemli (Artificial Earth Satellites) and which contains information on Sputniks I and II, came off the press on 26 December 1957 bearing a 1958 publication date. Sputnik III was launched on 15 May 1958.]

Solar Battery in Sputnik III

A newspaper item entitled "Solar Batteries," written by Engr Vice-Adm Ya. Varaskin, Candidate of Technical Sciences, to satisfy a request of a reader, Sr Lt A. Korolev, gives the following information:

The first two Soviet sputniks used electrochemical batteries; Sputnik III uses solar batteries.

In recent years, Soviet attempts to convert solar energy directly into electrical energy have met with considerable success. A semiconductor photocell with an efficiency of 10 percent was successfully developed. Last year, a model of such a semiconductor battery (silicon) was exhibited at the pavilion of the Academy of Sciences USSR at the All-Union Industrial Exhibit.

Vertically incident solar radiation falling on a one-square-meter area produces approximately 1,000 watts of power. A solar battery one square meter in size, having an efficiency of 10 percent, produces 100 watts, which is enough to power a series of radio-electronic instruments.

The solar battery on Sputnik III is made up of nine sections. Four small sections are mounted on the forward underside and four (with one section at the side) sections, on the rear underside of the satellite. This arrangement guarantees normal operation, regardless of the orientation of the satellite.

Each cell of this battery consists of thin sheets of pure monocrystalline silicon with a given electron conductivity; each cell supplies about 1/2 volt. (Moscow, Sovetskiy Flot, 29 May 58)

World-Wide Television by Means of Artificial Earth Satellites

Under the heading "Report out of the Near Future," N. Varvarov, Chairman of the Section of Astronautics, DOSAAF, USSR, describes a radio broadcast which begins with the "sensational announcement":

"The first International Television Studio will begin world-wide experimental broadcasts in the first part of July of this year." This "sensational announcement", is followed by a presentation by "an associate of the International Committee of Television Broadcasting", who proceeds to explain the means by which this is to be accomplished.

"'As is known', he stated, 'the transmitting range of television pictures is determined by the limits of direct visibility, that is, by those conditions when the transmitting and receiving antennas of the television centers are visible to each other. This is explained by the fact that the ultrashort radio waves by which television pictures are transmitted are propagated in a homogeneous medium in a straight line, similarly to the light rays of a projector. But since the Earth has the shape of a globe and such radio waves cannot be bent around its curvature, the range of television transmission is naturally limited. That is why at present, reception of television pictures by a receiver more than 100 kilometers away from the transmitter, is unsatisfactory.

"'The transmission of television images at a considerably greater distance than direct visibility was possible under fixed conditions at the expense of the scattering of radio waves, a result of the heteorogeneity of certain ionized layers of the ionosphere. But reception at such distances is as yet still irregular and unstable.

"'To surmount this shortcoming, radio relay lines of communication are used in the practice of television broadcasting over great distances. Such lines represent a chain of automatically operating receiving-transmitting radio stations. These are spaced about 50 kilometers apart, which, in flat country, ensures mutual visibility of the receiving-transmitting antennas. Sent in the form of a narrow beam by the transmitter of one of these stations, the radio signals are picked up by the receiving antenna of another station. They are then amplified by a special apparatus and fed into this station's transmitter, after which, by a similar directional beam, they are transmitted to the next station, and so on.

"'This method lends itself very well on land, as the establishment of such stations gives rise to no great difficulty. On the other hand, the wide reaches of seas and especially of oceans would require collossal expenditures for the erection of such connecting links. Also, far too complex, because of technical and operational drawbacks, is the solution of the problem of very long range television transmission using aerial retransmitters -- balloons, helicopters, or aeroplanes, The use of flying apparatus for retransmission would increase the range of television broadcasting by not more than 400 kilometers.

"'The described methods still do not guarantee a solution of all the problems of very-long-range television broadcasting. Therefore the necessity arose of searching for other, more economical and reliable methods.

"'With the launching of the artificial Earth satellites a prospect for the solution of these problems was available.

"'It was determined that the velocity of the flight of a satellite, the time of its orbit around the Earth, and the diameter of the Earth's surface being surveyed from the satellite depend on the satellite's altitude. From a satellite at an altitude of 1,000 kilometers, the diameter of the area being surveyed is 6,719 kilometers. With a velocity of 7.35 kilometers per second, it makes one full turn around the Earth in 1 hour and 45 minutes. With an altitude of 7,000 kilometers, this velocity amounts to 5.46 kilometers per second, and the diameter of the area being

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surveyed is increased to 13,698 kilometers. A satellite moving with this velocity has an orbital time of not more than 4 hours and 16 minutes. The Moon -- a natural satellite -- at a distance of 384,000 kilometers from the Earth, around which it revolves approximately once a month, has a velocity of about one kilometer per second.

"'But is there not an orbit lying between the Earth and the Moon, moving along which, a satellite could make a complete revolution of the Earth in one day. There is such an orbit. It would lie in the plane of the equator at a distance of 35,800 kilometers from the Earth. Moving along it at a velocity of 3,076 meters per second, the satellite would have an angular velocity equal to the angular velocity of the Earth's rotation around its own axis. Because of this, would it "hang" over one and the same region of the surface of the Earth at all times. From on board such a satellite, the Earth would be visible under an angle of approximately 17 degrees, which will make it possible to conduct observations of territory, the length of whose arc is 18,000 kilometers, i.e., about half of the Earth's total circumference.'

"Taking into account this extremely favorable factor, the associate of the International Committee states: 'we have launched three satellites equipped with the necessary receiving-transmitting television apparatus operating on a wide wave band at an altitude of 35,800 kilometers in an orbit passing in the plane of the equator. The satellites were launched at time intervals of 8 hours.

"'Using a special receiving-transmitting antenna having automatic tracking apparatus, the satellite will be continuously rotated toward a determined transmitting television center on the Earth. Each satellite will catch radio signals transmitted from the Earth, amplify them, and transmit them to the adjoining satellite for retransmission to another continent, or, conversely in its own sector. Stable and continuous reception of television transmission will be ensured, independent of the distance in this sector of the transmitting television center from the televiewer.

"'Radio communication between the satellites themselves and with the Earth will be done on different wave lengths. Thus, transmission from the Earth to the satellites will be conducted on metric waves, and conversely -- by shorter waves -- decimeter, centimeter, and millimeter waves. Mutual communication between the satellites is accomplished on centimeter or millimeter waves.

"'These requirements create a necessity for light and small-size apparatus to be carried by the satellite retransmitters. The receiving-transmitting apparatus, the power pack, atomic batteries or instruments directly transforming solar energy into electricity, and also a device for stabilizing the location of the satellite in universal space will comprise its main weight.

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"'The first experimental transmission will show how to cope with this great problem confronting the International Committee of Television Broadcasting.'"

Varvarov concludes his article with the following statement:

"At present, all of this is still a dream, but a real dream; we do not doubt that the great powers would join together for its solution; then the problem of universal television broadcasting would be solved soon." (Moscow, Vechernyaya Moskva, 7 May 58)

Measuring the Brightness of Sputnik II

V. P. Tsesevich, Corresponding Member of the Academy of Sciences Ukrainian SSR, of the Odessa Astronomical Observatory, describing one aspect of observations of Sputnik II, states that the second artificial earth satellite, launched by Soviet scientists on 3 November 1957, while in flight, displayed a somewhat unexpected but extremely interesting characteristic. Its brightness underwent considerable variation. Its brightness sometimes exceeded that of Vega, one of the brightest stars. In other passages through the sky, the sputnik barely attained the brightness of the North Star, that is, of a star of the second magnitude.

If the flight of a satellite is followed for 2 to 4 minutes while it traverses the arch of the sky, it is not difficult to detect during this time that its brilliance strengthens and weakens approximately two to three times. This indicates that the satellite is rotating around an axis; the axis of rotation does not coincide with the longitudinal geometric axis of the body of the rocket carrier and therefore this rotation can be compared to a tumbling action. It is easy to understand, therefore, how these changes in the satellite's brightness occur.

The satellite with its rocket-carrier is an elongated body. When the body rotates in space in such a manner that the sectional area being observed is least, the satellite attains a minimum brightness. If the maximum section of the body is observed, the maximum brighuness is also seen. Rotation around a certain cross sectional axis leads to periodic variations of the area of the observed cross section, which caused changes in the brightness of the satellite. All of this can be increased still more by the dissimilar reflective capacity of the different parts of the rocket-carrier and its orientation at a given moment in relation to the rays of the Sun. The period of the fluctuation of brightness is equal to a half period of rotation of the satellite around its axis.

Variations in the brightness of a satellite can also be caused by the presence of high, thick cloud masses in corresponding (distant) regions of the Earth. This will considerably complicate the phenomenon of the changes in brightness, mainly caused by the satellite's rotation.

Systematic observations of the brightness of Sputnik II were conducted in the Odessa Astronomical Observatory during all of its passes over the region. These observations were conducted by the author and independently by V. M. Grigorevskiy, Aspirant.

This work led to the conclusion that such observations must be conducted visually. Photographic observations contain a number of extremely significant difficulties of an experimental nature, and their results would scarcely warrant the expenditure of much effort. The brightness of the fast-moving star-like satellite is compared by the author with the brightness of the surrounding stars, by the same method which is used during visual observations of variable stars. The brightest and faintest stars are selected from this comparison. This interval is divided into tenths and the brightness of the satellite is evaluated by this scale. For calculating the brightness of the stars observed, comparisons of star magnitudes in accordance with the Harvard photometric system are used. Since the satellite moved very rapidly, the use of a secretary was necessary for recording the values dictated. The time, according to a chronometer or secondometer, was also recorded with an accuracy of one to 2 seconds. This made it possible to construct a brightness curve for Sputnik II in the course of its passage over Odessa.

The results showed that in December, Sputnik II rotated with a period close to 160 seconds. In January, its rotation slowed, and the period was close to 240 seconds.

For determining an accurate value for the period of rotation of a satellite, observations made from a single point are insufficient. From one cycle of the changes in brightness, the value of a period can be determined with an accuracy of up to 5 seconds, and no more. If a second observation is made on the following day, 1,440 minutes will have passed and the satellite will have made 500-600 turns around its axis. Consequently, to tie in the observations of two successive passages will not be successful.

Therefore, it is necessary to set up observations of the brightness of the satellite at different points and to consolidate these observations into a single system. Only in this way will it be possible to determine the accurate period of a satellite's rotation around its axis and to detect its alteration.

Variations of the period of rotation of a satellite can be caused by the influence of the resistance of the medium, by encounters with meteoric bodies, by the separation of some part from the satellite, and also by the action of the Earth's magnetic field. Consequently these changes can be the means of studying many phenomena.

All of these findings compel us to regard photometric observations of satellites as a means of studying its rotation and of studying the properties of the Earth's atmosphere. (Priroda, No 4, Apr 58, pp 78-79)

Observatory at Kamenskoye Plateau Commended for High-Quality Work in Satellite Observations

Satellite observations are being carried out in a new building constructed especially for the IGY at the Astrophysics Institute of the Academy of Sciences, Kazakh SSR. D. A. Rozhkovskiy, Candidate of Physicomathematical Sciences, is directing the effort. The observatory is located on Kamenskoye Plateau near the peak of Zabliyskiy Ala-Tau.

At a recent conference on the results of observations on Sputnik II, the observatory was commended for having the best method of observation and the highest quality photographs. Scientists at the observatory have developed a special attachment for their 500-mm meniscus telescope which allows them to record the passage of a satellite with an accuracy of one thousandth of a second.

Observations on the third satellite have not yet been made because of poor visibility near the observatory. (Moscow, Pravda, 18 May 58)

A photograph appearing in another Soviet newspaper bore the following caption:

"In the Alma-Ata high mountain observatory of the Astrophysical Institute of the Academy of Sciences Kazakh SSR, observations for artificial earth satellites are conducted under the supervision of D. Rozhkovskiy, Candidate of Physicomathematical Sciences, head of the Department of Astrophysics, using the Maksutov 500-millimeter meniscus telescope system. For photographing satellites the institute is equipped with the Soviet-designed NAFA camera. Here, one of the first successful pictures of the rocket carrier of the Soviet artificial earth satellite was obtained."

The photograph shows V. Matyagin and A. Kharitonov, junior scientific associates, of the institute at work with the telescope. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 25 May 58)

Obelisk to Commemorate Sputnik I Launching

On the recommendation of the Council of Ministers USSR in March of this year, to the Moscow City Executive Committee, the State Committee of the Council of Ministers USSR for Construction, the Ministry of Culture USSR, and the Academy of Sciences USSR announced an open competition for the best design of an obelisk built to commemorate the launching in the Soviet Union of the world's first artificial Earth satellite. The obelisk will be erected in Moscow in the Lenin Hills.

The competition is now closed. Nearly a thousand designs, models, sketches, drawings, and written proposals were received by the contest board in Moscow.

Within a very short time, the designs of the obelisk entered in the competition will be shown at the Central Exhibition Hall in Moscow. (Moscow, Izvestiya, 17 May 58)

Instructions for Observing Meteor Trails

A detailed discussion of meteor trail phenomena and instructions for their observation are presented by I. S. Astapovich, member of the Institute of Physics and Geophysics of the Academy of Sciences Turkmen SSR, in an article entitled "Methodical Instructions for Observations of Meteor Trails, Their Drift, Diffusion, and Turbulence." Following is a complete translation of the article as it appeared in a Turkmen scientific journal.

Introduction: As is known, meteors in flight cause ionization of air. The reverse process of deionization, in which ions again form neutral atoms as a result of recombination, is accompanied by radiation of energy which can be observed in the optical range. Trails of meteors of 1 to 2 stellar magnitude begin to be visible to the naked eye and sometimes those of weaker ones if the geocentric velocity of the meteors exceeds 47 kilometers per second. Then, the energy of the meteor becomes sufficient for the deionization to be visible to the naked eye. Telescope, visual, radar, and photographic observations jointly point out that the intensity of a trail's luminescence is proportional to the absolute brightness of the meteor itself. For example, meteors visible only with a telescope do not leave trails visible to the naked eye. We shall not concern ourselves with meteor trails observable by radar.

General description of the phenomena: No meteor trails remain after passage of ordinary meteors, even if optical instruments are applied for observations. Out of a hundred meteors, only a few leave trails. Of these, an overwhelming majority are visible for one to 2 seconds and are not persistent trails. However, in certain cases, depending basically on the brightness and velocity of the meteor, and subsequently on the physical condition of the atmosphere in the path of the meteor, the meteor trail is visible for several tens and even hundreds of seconds. These we shall term as being persistent. However, there are such periods as those of Perseids, Leonids, and Orionids when there are several such trails in one night and also those when there are none for an observation period of 100 hours (for example, February-March).

During its appearance and for the first moments of visibility, a meteor trail has the form of a strictly rectilinear misty stripe. If the trail is 'dense,' i.e., formed by a meteor with sufficient brightness, then, as the result of irradiation, it is preceived with the naked eye as being spindle-shaped and bulging at the center. However, it is only necessary to view it with binoculars or a comet tracker and it becomes obvious that the width of the stripe is uniform throughout (it is equal to one-2 minutes). At the point where the meteor was brighter, the brightness of its trail is higher so the distribution of brightness along the trail copies the brightness of the meteor itself. We shall initially make the reservation that usually the trail does not form over the entire length of the course λ of the meteor but only for a portion of the path, so that the length of the trail λ_s usually satisfies the condition. $\lambda_s - \lambda$. The maximum brightness of trails lies at altitudes of H_s=87 to 82 kilometers, and the ends of the trails lie at 15 to 20 kilometers above and below. Therefore, the linear length of the path of a meteor trail consists of several tens of kilometers. However, in relation to the position of the trail relative to the observer, its visible angular length λ_s changes within wide limits: from $\lambda_s = 0^\circ$ (stationary meteor) to $\lambda_s = 100^\circ$ and more (horizontal trajectory with the radiant at the horizon). Usually $\lambda = 6^\circ$ to 10°, and often 15 to 20°. The ends of the trail gradually disappear. At the points of explosions and flares of the meteor, the trail has enlargements and condensations. Under high mountain conditions of observation, it can be seen that the appearance of a meteor is preceded by an air glow which is rather weak and describes a band with a width of 2 to 3 degrees and a length equal approximately to that of the meteor's path λ. These 'bluish trails' of meteors which sometime appear in the predawn hours should be located at altitudes of 160 to 120 kilometers. They are visible for only one to 2 sec.

Changes in trail form. Morphology of trails: Several seconds after the flight of a meteor, it is possible to see with the naked eye how the trail begins to appear dented and later progressively bends. A general weakening of the trail's brightness occurs, proceeding from both ends. The most dense portion of the trail remains visible for the longest period. If a trail is visible for tens of seconds, then, beginning approximately after 20 to 40 seconds, the formation of a dark canal within the trail is visible in many cases. This dark canal takes on the form of a hollow within a tube ('tube of Traubridzh'). The principle of its formation consists of the fact that in the formation of the trail, the positive ions, being heavier, are distributed tens of meters from the trajectory, whereas the light electrons, as is indicated by radio observation, form a narrow cylinder with a diameter of only several decimeters. As recombination begins, the light emissions about the axis of the trail end first, resulting in the formation of a dark canal. If the trail continues to remain visible, then, after several tens of seconds, the air currents deform it to such a degree that the 'tube of Traubridzh' is disintegrated. However, often, another phenomenon appears: the ends of a trail tend to contract to the place where the trail is brightest, and here, a bulge forms. At this time, the remaining portions of the trail weaken to such an extent that they cease to be visible and only the bulge remains, disappearing last, often after 3 to 5 minutes or longer. On the average, the number of trails with bulge formations is one for every 60 hours of observation. In particularly exceptional cases, after the flight of bright bolides, gaseous trails may remain which are visible for half an hour or longer. As an example, on 15 September 1945, a bolide trail was observed in Ashkhabad for 38 minutes. Within 15 minutes, it was transformed into a gigantic lens with a diameter of about 11 km and a thickness of 4 km and was drifting slowly under the action of air currents. Decrease of brightness in such cases occurs very slowly. If a meteor produces two or more flares in flight, then the trail has a corresponding number of nodes which develop into bulges. The diameter of such bulges is about 3 kilometers. Dimming from the periphery, they gradually become invisible. The mechanism of their formation is probably tied in with electrostatic processes.

However, the greatest deformation of a trail is caused by air currents. Due to them, a trail can acquire serpent-like, looped, and other forms. Usually changes of form occur rather quickly so that it is necessary to record more frequently, for example, every 20 or 40 seconds.

Drift of meteor trails and air current: In addition to a trail's own movements, which are caused by the formation of condensations and diffusions, it can be seen that the entire trail changes position relative to the stellar background. This displacement is apparent due to the daily rotation of the stellar background. Considering this, we obtain a visible displacement distorted by perspective. Due to the fact that different portions of a trail are located at different altitudes, they are carried off in different directions and at different speeds. We term this effect the drift of a meteor trail. From observations, it is important to establish the direction and speed of drift, i.e., find its vector V_d. A trained observer, knowing the sky well and orienting himself on it quickly, obtains valuable data as he plots the position of the trail on a star map every 20 to 30 seconds. Here, binoculars are particularly useful, as they make it possible to examine the entire trail, even though it is not located in one visual field. For a less experienced observer, it is recommended that the binoculars be mounted in a stationary manner and that the observer can evaluate the interval of time Δt in which the trail or its detail (bulge, node, etc.) passes through the transverse D of the visual field. In this case, the effect of the rotation of the sky is excluded. Then it is necessary to establish the position angle θ for the direction of drift in the visual field of the binoculars. From here, with the formulas of Fedynskiy, we find the displacements of the trail according to the azimuth Δ a and the zenith distance Δ z:

$$\Delta a \sin z = D \sin \theta \; ; \quad \Delta z = D \cos \theta \, , \qquad [1]$$

and knowing the distance to the trail r (for example, from basic observations or with assumption of the constancy of the known altitude of the trail H_s), we find the true projections of the velocity V_d in the horizontal place according to the formulas:

$$V_x = H_s \sec^2 z \text{ arc } 1' \frac{\Delta z}{\Delta t}; \quad V_y = H_s \sec z \text{ arc } 1' \frac{\Delta a}{\Delta t}, \qquad [2]$$

whereby the angle of direction of drift α with the azimuth of the trail as is given in the expression

$$tg\,\alpha = \frac{V_y}{V_x}, \qquad [3]$$

from where we obtain the full speed of drift $V_d = \sqrt{V_x^2 \; V_y^2}$ and its azimuth $a_d = a_s - \alpha$. Based on the constancy of H_s, there are observations which indicate that the vertical drift is practically nonexistent or does not reach 10 percent of the speed of horizontal displacement. Recalling the fact that if we continue the direction of drift visually up to its intersection with the horizon line, we shall find approximately the azimuth of drift which is the azimuth of this point of intersection. This is important in preliminary rough estimates to avoid large errors. This principle, following from the laws of perspective, would be quite correct if movement of the star background were not present. For facility of the observer, it would be suitable to calculate a table of corrections which would be introduced into the observed displacements $\Delta\alpha$ and $\Delta\delta$, if the observer uses the first method (insertion of the trail on a sky map). When applying the second method (fixed instrument), it is absolutely necessary to make sketches of the form of the trail.

Diffusion of a trail: When observing a trail, it is easy to estimate its visible angular width d_s knowing the angular distance between the wide star pairs such as ε and 5 of Lyra, α_1 and α_2 of Capricornus, ϑ_1 and ϑ_2 of Taurus and others. Each observer should select appropriate standards for angular distances in the sky and compare the width of the trail d_s with them every minute, on the minumum. Then it is easy to see that in general, d_s grows with time and may reach 10' and even 15'. In the moments after formation, the linear width D_s of the trail is approximately 40 meters and sharply increases. This phenomenon is called diffusion of the trail. Since the latter acts perpendicular to the axis of the trail in all directions, then the speed of diffusion δ is equal to $\frac{\Delta D_s}{2\Delta t}$, where ΔD_s is the increase in the diameter of the trail after the interval of time Δt. The speed of diffusion depends on the time of the day and year and even on the 11-year solar cycle, not to mention the fact that at a greater height of H_s it is higher to the extent that the coefficient of diffusion is inversely proportional to the air density and directly proportional to the square root of the temperature of the medium. However, it is necessary to take into consideration that the weakening of the trail's brightness proceeds in a direction opposite to diffusion and therefore distorts it so that it is necessary to make the corresponding corrections. The magnitude of diffusion is usually within the limit of 5 to 12 meters per second, however deviations in either direction are encountered. Optimum conditions for the most prolonged visibility of a trail, and therefore for the determination of its δ, will exist when a flare or explosion in the meteor takes place in the altitude interval of 87-84 kilometers. This does not always occur, and, therefore, persistent trails are rare.

Atmospheric turbulence: While observing a meteor trail, we see how different parts of it drift in different directions. The thickness of an air layer making up one current usually consists of 2 to 10 kilometers. This flow appears laminar. However, it is often possible to see that some certain portion of the trail is encompassed by more or less intensive turbulent motion, which is sufficiently rapid to strongly change the outline of a trail in a short time and which encompasses a volume of space with a cross section of 3 to 5 kilometers and more. Such cases require particularly attentive observation and careful registration.

Organization for visual observations of meteor trails: The most suitable instrument for observation of meteor trails is a mounted binocular (due to its mounting and ability for quick direction of the binocular to any point in the sky). In other cases, good binoculars are satisfactory. It is of practical value to match observations of trails with programmed meteor observations in as much as trails, as has been stated, appear infrequently and to spend time only to wait for them is not logical. Therefore, having detected a meteor which left a trail, it is then necessary to direct the instrument to it, bearing in mind that the duration of visibility τ_s of the trail is five to 20 times longer with the application of optics. Ordinarily, a trail has already disappeared in this time, and it is necessary to wait for the appearance of a subsequent trail. When this occurs, we direct our instrument to its brightest portion; by this time, the remaining portion of the trail has already begun to deform. Having begun counting the seconds according to the beats of a chronometer, we record a mental picture of the form and position of the trail for each 30-, 60-, and 90-second beat. When the meteor trail has finally disappeared, we record the observations in a journal, accompanying them with the required schematic drawings. We do not forget to remark on the position (initial of the trail relative to the stars, its drift, width, and also its approximate azimuth and zenith distance. Having traced the direction of drift by memory, we estimate its azimuth on the horizon. We record all the characteristics of the meteor which left the trail (the moment, appurtenance to a determined stream, visible brightness, color, path length, angular velocity, position relative to the stars, and other characteristics). At first, this all seems impossible to accomplish, but experience develops in the process of practice. With a stationary mounted instrument of the binocular type observations are simplified, although many parts of the trail remain outside of inspection. For $\tau_s \leqslant 5$ to 8 seconds the values of the drift Δs of the trail are unreliable. In this case, it is sufficient to limit oneself to calculations of τ_s, d_s, and λ_s only.

It is desirable to conduct observations every clear night in the IGY period, but imperative for days in the time table. It must be kept in mind that according to regular behavior in the appearance of the majority of meteor bodies, we have no special increase in the amount of trails in the period before morning. Actually, their daily variation indicates a 'midnight minimum' and therefore it is better to make observations after 0100 hours local time. It is important not to confuse gaseous trails of meteors with dust trails appearing at early dawn after bolides at $H \approx 65$ kilometers. Therefore, observations should not be conducted at twilight, early dawn, on a moonlit night, etc., and also not low above the horizon. Powerful instruments are not useful for observation of trails and are even a detriment, as working with them leads to the loss of valuable time.

"Form of observation log: The form of the log of observations is standard for meteors and is supplemented with sketches of the position of the trail, estimate of its width d_s, position, angle θ, and interval of time Δ t. Parallel independent observations by two persons are valuable. Of particular value are those of base observations in which parallel observations on each end of the base are conducted."

(Izvestiya Akademii Nauk Turkmenskoy SSR, No 2, 1958, pp 107-110)

Noctilucent Clouds

V. G. Teyfel', in the article "Noctilucent Clouds," which appeared in Trudy of the Sector of Astrobotany of the Academy of Sciences Kazakh SSR, describes the principal features of noctilucent clouds and gives a number of problems which are connected with their study. A summary of the results of determinations of the altitudes of noctilucent clouds occurring in the past, both basic as well as one-sided, are given. The latter are based on the supposition that the upper boundary of the noctilucent clouds being observed is illuminated by the rays of the Sun which are tangent to the Earth's surface. The one-sided determinations give low values of altitudes, since the rays are weakened by the lower layers of the atmosphere. Velocities of the movement of air masses in the zone of noctilucent clouds are within the limits of 20-200 meters per second. By observations of the systems of ridges, their perspective approach to the horizon (knowing the length of the wave and the linear width of the ridges) makes it possible to evaluate the vertical thickness of these formations. Using this method, the author determines that the thickness of the ridges cannot exceed one to 1.2 kilometers.

Further, in succession, the different hypotheses of the origin of noctilucent clouds are described and a critical examination of them is given. The author considers as the most probable the hypothesis that noctilucent clouds are formed by the condensation of water vapor into ice crystals. Water vapor necessary for condensation appears in the zone of noctilucent clouds mainly because of terrestrial factors.

A considerable part of the article is devoted to an explanation of the optical properties of noctilucent clouds. A study of the spectral composition of the radiation of noctilucent clouds shows that in accordance with visual evaluations, there are two maximums in their spectrum -- in the green and in the red parts. It is fully possible that under the action of the Sun's ultraviolet radiation, noctilucent clouds luminesce, however this has not been proven. If notilucent clouds only scatter sunlight, then their upper boundary must have reddish hue, that is, the rays illuminating it pass low over the Earth's surface, undergoing a selective absorption; however this is not observed. In the case of luminescences, the angular altitude of the upper boundaries will be dependent on the layer of ozone, absorbing the ultraviolet radiation, and may be evaluated according to the known linear altitude of noctilucent clouds. This method is considered useful also in studying the absorbing layer as well. In this, it is necessary to account for the degree of contrast of the noctilucent clouds with a background of twilight sky and its changes with altitude. The study of temporary variations of the brightness of noctilucent clouds, as well as the absorption of the light of celestial objects by them, is of interest.

It is possible to compare noctilucent clouds with clouds on Mars, and from this it is thought that the latter also must consist of ice crystals. Obviously, as a consequence of the low temperatures, the role of these crystals in the atmosphere of Mars is great. The author emphasizes the need for a complex study of noctilucent clouds. (Referativnyy Zhurnal, Geofizicheskaya, No 1, Jan 58, Abstract No 765, by N. D. Rozenblyum)

Polarization of the Light of a Twilight Sky

The results of measurements of the intensity and the degree of polarization of the light in a twilight sky at zenith conducted in September and October 1955 in the Mountain Observatory of the Astrophysical Institute of the Academy of Sciences Kazakh SSR, are reported in an article, "Polarization of the Light in a Twilight Sky at Zenith," by N. B. Divari, which appeared in Doklady Akademii Nauk SSSR, Vol 112, No 2, 1957, pp 217-220.

During the setting of the Sun below the horizon at an angle $a = 5-9^{\circ}$, the degree of polarization p increases with the wave length λ , and with $a > 9^{\circ}$, the reverse condition is observed. In the blue and green rays, the plane of polarization retains its direction relative to a vertical to the Sun down to $a = 14-15^{\circ}$; with greater angles of "a", the plane begins to turn in a single direction. The ratio of the intensities I_1 for $\lambda_1 = 4700 Å$ and I_2 for $\lambda_2 = 6{,}000$ Å with a growth of a starts to increase, with $a = 9-10^{\circ}$ the ratio I_1/I_2 reaches a maximum and then drops, as was determined by observations made by T. G. Megrlishvili at the Abastuman Observatory on Kanobili Mountain during 1942-1946. Comparing the change in the ratio I_1/I_2 with the change of p, the author expresses the supposition concerning the presence at altitudes of 100 kilometers and over, of particles with a size $\sim 10^{-4}$ centimeters, scattering neutrally or even according to the law $\sim \lambda^{+1}$. The comparison of "p" with the coefficient of transparency showed the presence of a positive correlation with $a = 9-10^{\circ}$. Values of "p" in the morning, as a rule are greater than in the evening. (Referativnyy Zhurnal-Geofizicheskaya, No 1, Jan 58, Abstract No 764, by I. A. Khvostikov)

Earth Electrical Currents Studied at Alma-Ata

In the mountains of Zailiyskiy Ala-Tau at an altitude of 1,800 meters above sea level, is located the geophysical station Alma-Ata, of the Institute of the Physics of the Earth of the Academy of Sciences USSR, The station is conducting observations according to the IGY program. Variations in the force of Earth electrical currents are recorded with the aid of automatic ally registering instruments.

S. Masarskiy, Candidate of Physicomathematical Sciences, chief of the station, stated that for the first half of the IGY, 1,300 electrograms of Earth currents were obtained. In the station's zone of activity, unusually strong variations of the Earth's magnetic field were observed, caused mainly by increased solar activity. The strongest magnetic storms were registered on 4 and 29 September 1957 and on 11 February 1958. Masarskiy pointed out the interesting fact that in February, the magnetic storm coincided with the aurora, a completely unusual thing for these latitudes.

Preparations are being made in the station for the installation of a unique apparatus for highly accurate measurements of short-period variations of the Earth's magnetic field. (Moscow, Izvestiya, 13 May 58)

V. OCEANOGRAPHY

Oceanographic Operations of the Sevastopol Expedition

Among the different scientific institutes of the Soviet Union engaged in oceanographic work under the IGY program is the Polar Scientific Research Institute of Marine Fisheries and Oceanography imeni N. M. Knipovich (Murmansk). On it lies the responsibility of fulfilling a series of oceanographic profiles in the Norwegian Sea and the northern part of the Atlantic Ocean with a wide complex of observations. According to A. P. Alekseyev, Candidate of Geographic Sciences, a new expeditionary ship of the Polar Institute, the Sevastopol was commissioned at the beginning of the IGY. The ship, a converted fishing trawler, has a displacement of about 2,800 tons and a speed of 10 knots. It is capable of sustained voyages of more than 2 months, without reprovisioning.

The Sevastopol is equipped with two electric winches of the "Okean" type and one designated as the LG-5,000, designed by the State Institute for the Design and Planning of the Fishery Fleet (Giprorybflot). The trawling winch, in addition to its special purpose, can be used in operations with dredges, bottom scoops, and for anchoring the ship in depths of more than 1,000 meters. The ship is equipped with different laboratories -- hydrological, hydrochemical, geological ichyological, and hydrobiological -- has four fathometers, two of them deep-water, powerful fish detecting apparatus, modern radio and navigational equipment, and a ship's remote control weather station. Up to 30 scientific personnel can be accommodated on board.

From July to September 1957, the Sevastopol made oceanographic profiles in the southern part of the Norwegian Sea, among them, profiles of Iceland, the Faeroe Islands, Scotland and Scandinavia. Soil samples and bottom organisms taken from the deep-water depression of the Norwegian Sea are of great interest. Valuable hydrological, hydrochemical, and hydrobiological materials were collected and actinometric observations were carried out. Drifting buoys for studying currents were released. Postcards from recovered buoys have already begun to arrive both from Soviet seamen as well as from abroad.

After completing operations in the Norwegian Sea, the Sevastopol conducted oceanographic investigations in the Denmark Strait, the success of which was aided by favorable ice conditions. Along the route to Murmansk, more than 20 oceanographic stations were conducted in the little-studied region between northwestern Iceland and the island of Jan Mayem. Fathometer measurements on a run of over 4,500 miles make it possible to substantially supplement maps showing depths of the Norwegian Sea and especially of Denmark Strait.

Associates of the Polar and All Union Institutes of Fisheries and Oceanography, the Murmansk Hydrometeorological Service Administration, students of Moscow University and other scientists of Moscow and Leningrad institutions took part in the expedition on the Sevastopol.

In the future, the Sevastopol will participate, together with ships of the hydrometeorological service and the Academy of Sciences USSR, in an oceanographic survey of the Norwegian Sea and the northern part of the Atlantic Ocean. In the work according to the IGY program, it is proposed also to use another expeditionary ship of the Polar Institute, the Professor Mesyatsev (Priroda, No 4, Apr 58, pp 111-112)

VI. SEISMOLOGY

Seismic Prospecting in Caspian Sea

Seismic prospecting for mineral resources in the Caspian Sea is reported progressing successfully. One crew is conducting investigations in a zone where the depth of the sea exceeds 500 meters. (Moscow, Izvestiya, 21 May 58)

VII. ARCTIC AND ANTARCTIC

Report on Soviet Research in Arctic and Antarctic

A press conference devoted to Soviet research in the Arctic and Antarctic took place in the State Committee for Cultural Relations With Foreign Countries under the Council of Ministers USSR. Soviet and foreign journalists attended the press conference.

P. A. Goridyenko, Candidate of Geographical Sciences, reported on research in the Arctic. He stated, in particular, that during the past 38 years, Soviet scientists had entered about 150 items on the map.

During 1958, more than 20 scientific expeditions to the Arctic are being organized.

M. M. Somov, Doctor of Geographical Sciences, told the reporters about the work of Soviet Scientists in Antarctica and surrounding waters. Prof B. L. Dzerdzeyevskiy talked about some of the preliminary conclusions drawn from the observations in the Antarctic. A report by Prof A. M. Gusev on the work of the Antarctic scientific station Pionerskaya aroused great interest. (Moscow, Izvestiya, 21 May 58)

Antarctic Temperature and Living Conditions

During May, the temperature at the interior Antarctic stations Sovetskaya and Vostok dropped to minus 78 and 79 degrees centigrade. This low temperature level has been recorded for the first time by human beings on the surface of the earth. The Soviet interior stations are situated on the ice sheet in the center of Antarctica at an altitude of 3,500 to 3,700 meters. The living quarters at Sovetskaya, Vostok, and Komsomol'skaya now have central water-heating systems and electric lighting, and the indoor temperature is maintained at a level of 17-20 degrees centigrade. Bath houses are provided for the station personnel.

Observations have to be conducted on outdoor platforms. With frosts below minus 70 degrees centigrade it is dangerous to remain outside for any length of time, and all kinds of precautionary measures are taken. The staff members do not remain outside for more than 20-30 minutes at a time. The men wear masks to protect their faces. An electric cable is laid to the observation platform. Heaters for the feet, hands, and chest, are connected to the cable.

The station personnel at the interior stations are all in the best of health and determined to carry out their scientific work program to the fullest extent. (Moscow, Pravda, 25 May 58)

New Sledges Ordered for Antarctic

In 1958, the Central Workshops of the Administration for Production and Installation of Equipment, Ministry of Maritime Fleet USSR, received a new order to produce for the Antarctic 16 sledges of improved design, made of duralumin, stainless steel, and ftoroplast (fluoroplastic). Six of these sledges are to have a load capacity of 20-25 tons, and ten of the sledges, 6-8 tons. (Riga, Sovetskaya Latviya, 26 Mar 58)

Temperature of -78° Centigrade Recorded at Vostok

On 2 and 3 May, the Soviet stations Sovetskaya and Vostok recorded a drop in temperature to minus 78 degrees centigrade. Until now meterologists had not observed such a low temperature at any point on the globe. In the opinion of Soviet scientists, it is possible that the air temperature at the station Vostok near the south geomagnetic pole, and particularly at Sovetskaya, near the pole of relative inaccessibility, might drop to minus 80-85 degrees centigrade. (Moscow, Vodnyy Transport, 10 May 58)

Gigantic Iceberg Found in Antarctic

During an ice reconnaissance flight, an IL-12 airplane of the Soviet Antarctic Expedition, piloted by V. M. Perov, discovered a gigantic iceberg. It was 90 kilometers long, 30 kilometers wide, and 40 meters high. Since the height of an iceberg above the sea represents only one sixth of its total depth, the depth of this one should be 240 meters.

It took a whole hour to fly around this ice block. The surface of the iceberg was almost flat, with a slight elevation toward the center, and its edges were cliff-like. Wide crevasses were seen in several places, resembling canyons with snow rivers, ice cliffs, and inlets.

It is possible that the "place of birth" of this iceberg was the Shackleton glacier. (Moscow, Komsomol'skaya Pravda, 8 Apr 58)

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